HPI Digital Health Center

Research Group: Connected Health

Prof. Dr. Bert Arnrich

Wearables for monitoring and driving lifestyle changes

Motivation

Lifestyle plays a major role in the life of people suffering from chronic diseases such as metabolic syndrome, diabetes, and hypertension, which are major risk factors for serious health conditions (e.g. myocardial infarction and stroke). In order to decrease the risk of complications and to lower parameters like weight, blood pressure, and blood sugar, for example, the patient needs to go through lifestyle changes and possibly medication intake.

Nowadays, it is possible to collect different types of data from daily life with consumer wearables (e.g. Fitbit and Apple Watch). Based on that, we can give patients feedback on their health status and provide healthcare professionals with insights on the progression of lifestyle interventions (e.g. new diets and exercise routines) and on how to better tailor each patient's treatment.

Project Goals

The main objective of this project is to monitor the health status of a person going through lifestyle interventions, mainly changes in their dietary and exercise routines. The focus will be on accompanying patients with chronic diseases like hypertension and metabolic syndrome. We want to analyse how parameters such as heart rate (HR), heart rate variability (HRV), blood oxygen saturation (SpO2), respiratory rate, sleep quality, and activity levels vary after the patients have gone through such an intervention. The idea is to build a pipeline to collect and analyse the data obtained from daily life and to provide information to healthcare professionals, regarding the patients' adherence to a prescribed intervention (e. g. a new diet or exercise routine).

Methodology

Some commercial devices such as Apple Watch have been proven to give accurate HR measurements and can even do ECG readings. We plan to use devices that share data with smartphone applications such as Apple Health and Google Fit. Data then can be transferred, for example, from each device to Apple Health, and through the Research Kit feed an App

that will provide information to patients and physicians. Afterward, the data can be shared with a centralised repository using standard guidelines (e. g. PCHAlliance Continua Design Guidelines[1] and FHIR[2]).
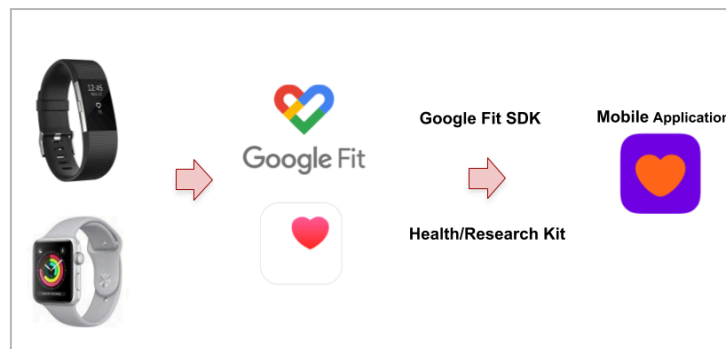

Figure 1. Possible Workflow for Data Sharing

Figure 2. Example of How Data is shared with Apple Health

Learning Expectative

First, you will learn about the user (patients with chronic diseases), and how to collect data from daily life. Next, how to use it to give meaningful insights to patients and healthcare professionals so they can best tailor and monitor each intervention.

Lastly, there will be the technical challenge of building a pipeline for data streaming and storage using standard protocols (e.g. Continua Design Guidelines[1] and FHIR[2]) and also, the development of an App to give meaningful insight to patients and physicians.

About You

You should be interested in working with a multidisciplinary team with backgrounds ranging from computer science to biomedical informatics and medicine. Good programming skills will be required. You should have an interest in developing mobile applications tailored to people with chronic diseases who will be undergoing lifestyle changes. Essentially, wanting to change the world, one app at a time.

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[1] https://www.pchalliance.org/continua-design-guidelines
[2] https://www.hl7.org/fhir/

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